

ADVANCED SUBSIDIARY (AS) General Certificate of Education 2014

Се	ntre Number
71	
Cano	didate Number

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[AB111]

FRIDAY 13 JUNE, AFTERNOON



TIME

1 hour 30 minutes, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

There is an extra lined page at the end of the paper if required.

Answer all eight questions.

You are provided with **Photograph 1.3** for use with Question 3 in this paper. Do not write your answers on this photograph.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks. Section B carries 15 marks.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You are reminded of the need for good English and clear presentation in your answers.

Use accurate scientific terminology in all answers.

You should spend approximately 20 minutes on Section B.

You are expected to answer Section B in continuous prose.

Quality of written communication will be assessed in Section B, and awarded a maximum of 2 marks.

For Exa	miner's only
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

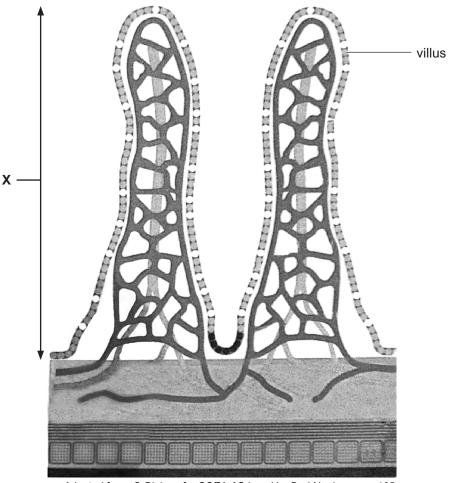
Total	
Marks	

Section A

Examiner Only

Marks Remark

1 The wall of the ileum is made up of several tissue layers, as shown in the diagram below.



Adapted from: © Biology for CCEA AS Level by Dr J Napier, page 105, published by Colourpoint Educational, 2012. ISBN 976 1 78073 010 3

Between each villus is a region containing some actively dividing cells called stem cells. These are able to divide and develop into a variety of cell types, each of which becomes a component of the tissue layer labelled **X** in the diagram.

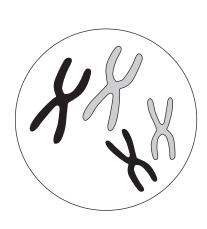
(a)	Write down the name of tissue layer X .	
		[1]

2

D (I II	
Paneth cells	
Goblet cells	

2 Look at the diagram below. It shows two stages in the process of nuclear division by meiosis. The diploid number of the cell shown in stage **A** is 4.

Examin	er Only
Marks	Remark



X



Stage A

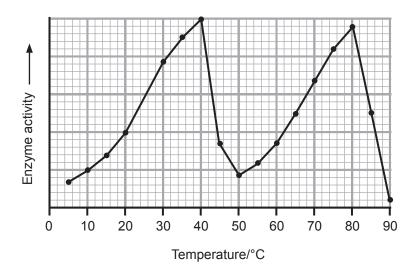
Stage B

(a)	Identify stage B .	
		[1

(b)	Describe the behaviour of the chromosomes between stage A and stage B .

with	ok at Photograph 1.3. It shows an electronmicrograph of a plant cell some parts of surrounding cells also visible. Some structures in the stograph have already been labelled.		aminer Only ks Remark
	Identify the structures labelled A, B and C .		
	A		
	В		
	c	[3]	
(b)	The magnification of this photograph is $\times 7500$. Calculate the width of the cell in μm along the line X – X . (Show your working.)	of	
	Answer μm	[3]	
(c)	Within the chloroplast a membrane system is clearly visible. Write about how this membrane system increases the amount of light energy absorbed.		
		_	
		[2]	
(d)	Suggest a reason why a nucleus is not visible in the photograph.		
		[1]	
		[1]	

4 Biological washing powders contain enzymes which help to break down stains on fabric. The enzyme activity in a biological washing powder at a range of different temperatures was investigated. The graph below shows the results.



(a) Describe and explain the trend shown in the graph between $5\,^{\circ}\text{C}$ and $45\,^{\circ}\text{C}$.

(b)	(i)	Suggest an explanation for the two different peaks observed in enzyme activity.	Examir Marks	er Only Remark
		[2]		
	(ii)	Suggest why such a pattern of enzyme activity would be useful in		
		biological washing powders.		
		[1]		
(c)	Sug 45°	ggest an explanation for the enzyme activity observed between °C and 55 °C.		
		[2]		

- **5** (a) A student tested five solutions (A–E) with Benedict's reagent, Biuret reagent, iodine solution and Clinistix. The student recorded the results in the following manner:
- Examiner Only

 Marks Remark
- When tested with Benedict's reagent, solutions A and C both produced a brick-red precipitate.
- When tested with Biuret reagent, only solution B produced a purple colour.
- When tested with iodine solution, only solution D turned blue-black.
- Solution E produced no colour change with any of the reagents.
- When tested with Clinistix, only solution **A** gave a positive result.
- (i) Construct a table of the results obtained by this student. Your table should include the following:
 - appropriate column headings
 - positive test results recorded with a ✓ and negative results with an ✗. All boxes should be filled.

8

No caption is required.

Do the table in the space below.

[3]

	(ii)	Suggest a possible identification for each of the substances present in solutions A to D .	Examine Marks	r Only Remark
		A		
		В		
		c		
		D [4]		
	(iii)	Describe how the test with Benedict's reagent would have been carried out.		
		[1]		
(b)	ider resu Clin	er carrying out the tests outlined in (a), the student wished to ntify substance E. After hydrolysis of E, it was found that the ulting solution now tested positive with both Benedict's reagent and nistix. In great which substance was originally present in solution E and give eason for your answer.		
	Sub	ostance E		
	Rea	ason		
		[2]		

		of functions. The specific function of a protein depends on its shape s determined by its sequence of amino acids.	Marks
a) ((i)	Identify the elements which are present in all proteins.	
		[1]	
((ii)	Explain what is meant when a protein is said to have a quaternary structure.	
		[1]	
Some	e fe	eatures of four human proteins are described below.	
		ratin is the major component of hair and nails. Its structure consists a repeating pattern of a sequence of seven amino acids.	
	_	psin is an enzyme found in the small intestine, where it is involved he digestion of proteins in food.	
		llagen is found in skin, where it maintains elasticity, and in dons, where it provides strength.	
8	ass	cin is found in saliva, where it makes food slippery and thus ists its passage from the mouth to the stomach. Its structure udes many carbohydrate chains attached to the protein.	
b) ((i)	From the list above, select a protein which could be categorised as follows. (Each protein may be used once, more than once, or not at all.)	
		a conjugated protein	
		a fibrous protein	
		a globular protein	
		a protein which catalyses hydrolysis[4]	
((ii)	Shampoo manufacturers sometimes state that their product contains amino acids.	
		Suggest why amino acids in shampoo are unlikely to be of use in the production of keratin in hair.	
		[1]	

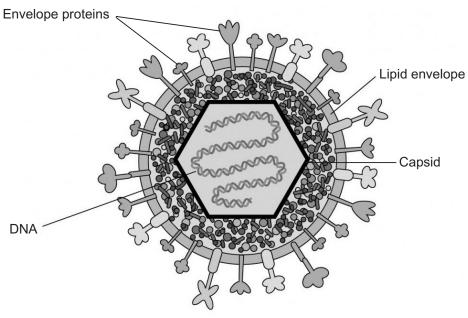
6

(c)	Sev role prof	Examine Marks	er Only Remark	
	•	Ribosomes		
	•	Rough endoplasmic reticulum		
	•	Golgi body		
		[3]		
(d)	via	ne proteins are secreted out of the cell in which they are produced, vesicles which fuse with the plasma membrane. ne this process of secretion out of a cell.		
		[1]		
(e)	use thre a pa	search in protein biochemistry has been greatly improved by the of molecular modelling software which allows users to view the se-dimensional structure of a protein. Often, scientists researching articular protein will make the molecular modelling file for that tein available to download via the internet.		
	Sug	gest an advantage of this file-sharing for scientific research.		
		[1]		

7 During the summer of 2013, it was reported that large numbers of oysters had died in Carlingford Lough in County Down. Tests on the dead oysters showed the presence of a virus called Ostreid Herpes Virus (OsHV). It is thought that the extended period of warm weather triggered increased infection rates in oyster populations.

Examiner Only

Look at the diagram below. It shows the structure of a Herpes Virus, similar to that which infects oysters.



© TWiV – This Week in Virology with Vincent Racaniello and friends. www.twiv.tv/virus-structure/ (adapted) Creative Commons Attribution 3.0 License

- (a) Use the information in the diagram to complete the following.
 - Write down one way in which the structure of this virus is similar to the structure of HIV
 - Write down one way in which the structure of this virus is similar to the structure of a bacteriophage

[2]

r	/arious methods are used to diagnose infection by this virus. Each nethod has been classified, according to its appropriateness and ease of use. The table below summarises this.	Examin Marks	er Only Remar
-	Table removed due to copyright issues.		
	The table described different methods of diagnosing infection and a classification of each method's use in OsHV diagnosis.		
•	Electron microscopy – classification c		
1	he classifications used in the table are summarised as follows:		
k S	 the recommended method for reasons of specificity and sensitivity a standard method with moderate diagnostic sensitivity and specificity a method which is useful in some situations, but factors including cost and/or accuracy severely limit its application. 		
T r r	o start with, tissue from dead oysters is examined using a light nicroscope, since the virus causes changes in the appearance of the nucleus of an infected cell. Then if a viral infection is suspected, PCR can be carried out.		
(Suggest why PCR is not carried out until tissue samples have been examined with a light microscope.		
	[1]		
(ii) Suggest why 'obvious signs' is classified as c .		
	[2]		
(iii) Suggest why 'PCR' is classified as a .		
	[2]		

		enzyme used in PCR.	[1]
/ii\	How man	y types of deoxyribonucleotides should be inclu	
(,			[1]
	ow are the ing for Osl	sequences of one primer pair which can be us	ed when
	C9 :	5'-GAG-GGA-AAT-TTG-CGA-GAG-AA-3'	
	C10:	5'-ATC-ACC-GGC-AGA-CGT-AGG-3'	
(iii)	Write dow	n the base sequence to which primer C10 wou	ld bind.
			[1]
(iv)	Explain w	hy primers are added in pairs.	
			[1]
(v)	_	e of the DNA of oysters was necessary for the loped this test for OsHV. Suggest why.	scientists
			[1]

Section B Examiner Only Marks Remark Quality of written communication is awarded a maximum of 2 marks in this section. Write an account of the process of osmosis in cells. Explain the effect of changing external solute concentrations on both animal and plant cells. [13] Quality of written communication [2]

8975.08 ML 15 [Turn over

	Marks	Remark
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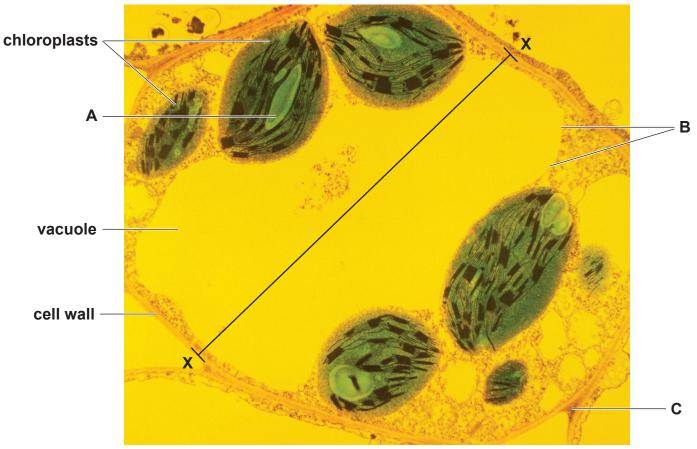
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GCE Biology Advanced Subsidiary (AS) Assessment Unit AS 1 Molecules and Cells Summer 2014

Photograph 1.3 (for use with question 3)



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Magnification ×7500